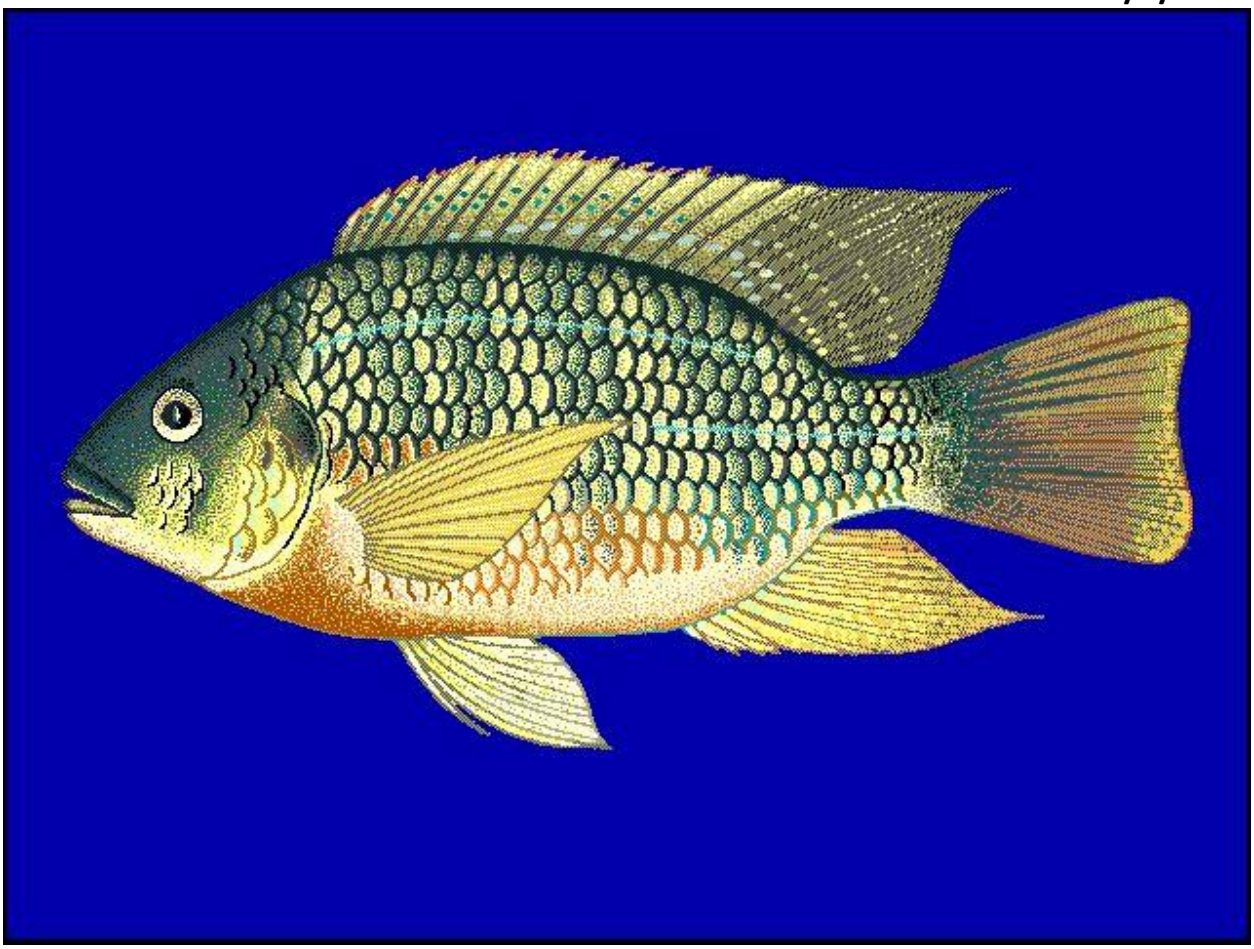
Redbreast Tilapia (*Tilapia rendalli*)
Ecological Risk Screening Summary

Web Version – 11/1/2012



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1 Native Range and Nonindigenous Occurrences

Native Range

From Nico (2012):

"Tropical and subtropical Africa. Cunene, Okavango, Zambezi system, east coastal rivers south to Phongolo, and coastal lakes to Lake Sibaya; also occurs in estuaries in Mozambique and Natal (de Moor and Bruton 1988; Skelton 1993)."

Nonindigenous Occurrences

From Nico (2012):

- **Hawaii** - "This species has been introduced on the islands of Kauai, Maui, and Oahu, Hawaii (Brock 1960; Morita 1981; Maciolek 1984). The species became established in Reservoir No. 44 on Maui during the late 1950s or early 1960s (Hida and Thomson 1962). As of about 1990, it is listed as having an uncertain status and its occurrence is limited to Oahu (Devick 1991a).
- **Puerto Rico** – "This species was stocked for biocontrol in the Loiza Reservoir near Carraizo dam and the Rio Piedras, Puerto Rico (Erdsman 1984). Specimens have been reported in non-specific locations in Puerto Rico (Lee et al 1983)."

Means of Introductions

From Nico (2012):

"This species was brought to Hawaii as a shipment of 52 fish from Africa in 1957; these fish were bred in tanks by the state, and resulting offspring were stocked in Wahiawa Reservoir in 1958 and 1959 and on Maui in 1959. According to Devick (1991b), these intentional introductions were undertaken for aquaculture (aku bait) and weed control. "

Remarks

From Nico (2012):

"Although this species was formerly considered established and spreading in Hawaii (Maciolek 1984), or at least established (Courtenay et al. 1991), its recent status in the state is considered uncertain (Devick 1991a). "

"This species is referenced as *T. melanopleura* in previous reports concerning introduced species (e.g., Maciolek 1984; Devick 1991a, 1991b). A report of *T. melanopleura* in Alabama by Smith-Vaniz (1968) was based on incorrect identifications of fish later shown to be *T. zillii* (Smith-Vaniz, personal communication). Barrett (1983) tentatively re-identified some California specimens, previously reported to be *T. zillii*, as *T. rendalli*; he based his determination on various morphological characters and color patterns. These fish were taken from near Blythe, Riverside County. *Tilapia rendalli* is a popular angling species in Africa, is important in aquaculture and fisheries, and also is used for weed control in reservoirs (Skelton 1993). The species is tolerant of a broad range of temperatures (11-37°C) and salinity to 19 parts per thousand (Skelton 1993)."

2 Biology and Ecology

Taxonomic Heirarchy

From ITIS (2012):

Kingdom Animalia
Phylum Chordata
Subphylum Vertebrata
Superclass Osteichthyes
Class Actinopterygii
Subclass Neopterygii
Infraclass Teleostei
Superorder Acanthopterygii
Order Perciformes
Suborder Labroidei
Family Cichlidae
Genus Tilapia
Species *Tilapia rendalli*

Taxonomic status: Valid

Size, Weight, Age

From Froese and Pauly (2010):

"Max length : 45.0 cm TL male/unsexed; (Anonymous 1994); max. published weight: 2,500 g (Anonymous 1994); max. reported age: 7 years (Skelton 1993)"

Environment

From Froese and Pauly (2010):

"Benthopelagic; freshwater; brackish; depth range 3 - 8 m (Mundy 2005)"

Climate/Range

From Froese and Pauly (2010):

"Tropical; 24°C - 28°C (Baensch and Riehl 1991); 20°N - 20°S"

Distribution

From Froese and Pauly (2010):

"Africa: Kasai drainage (middle Congo River basin), throughout upper Congo River drainage, Lake Tanganyika, Lake Malawi, Zambesi, coastal areas from Zambesi Delta to Natal, Okavango

and Cunene (Teugels and Thys van den Audenaerde 1991). Also in the Limpopo (Thys van den Audenaerde 1964). Introduced elsewhere usually for weed control and aquaculture. Several countries report adverse ecological impact after introduction."

Short description

From Froese and Pauly (2010):

"Dorsal spines (total): 15 - 17; Dorsal soft rays (total): 10-13; Anal spines: 3; Anal soft rays: 9 - 10; Vertebrae: 29. Head and body mid to dark olive-green dorsally, paling over the flanks. Body usually with vertical bars only and scales with a dark basal crescent. Dorsal fin olive-green with a thin red margin and white to grey dark oblique spots on the soft rays; caudal fin spotted on dorsal half and red or yellow on ventral half (Eccles 1992, van Oijen 1995)."

Biology

From Froese and Pauly (2010):

"Prefer quiet, well-vegetated water along river littorals or backwaters, floodplains and swamps. Tolerant of a wide range of temperature (8-41°C) (Philippart and Ruwet, 1982) and salinity to 19 ppt (Skelton 1993). Form schools; is mainly diurnal. Juveniles feed on plankton. Adults feed mainly on higher plants and also algae, insects and crustaceans."

Human uses

From Froese and Pauly (2010):

"Fisheries: commercial; aquaculture: commercial; gamefish: yes; aquarium: commercial"

"Make excellent eating (Bruton et al. 1982)."

Diseases

The following list of parasitic infestations and diseases is taken directly from Fishbase (Froese and Pauly 2010) and more details on each entry can be found there. None of the diseases are OIE-reportable (OIE 2012).

"Anchor worm Disease, Parasitic infestations (protozoa, worms, etc.)"
"Cichlidogyrus Disease, Parasitic infestations (protozoa, worms, etc.)"
"Clinostomum Infestation (metacercaria), Parasitic infestations (protozoa, worms, etc.)"
"Acanthogyrus Infestation, Parasitic infestations (protozoa, worms, etc.)"
"Paradilepis Infestation, Parasitic infestations (protozoa, worms, etc.)"
"Acanthogyrus Infestation, Parasitic infestations (protozoa, worms, etc.)"
"Eye Infection (Diplostomum sp.), Parasitic infestations (protozoa, worms, etc.)"

Threat to humans

From Froese and Pauly (2010): "Potential pest"

3 Impacts of Introductions

Sources on the effects of *T. rendalli* introductions could not be found, but other tilapias have been described as highly invasive.

From Canonico et al. (2005):

"The common name 'tilapia' refers to a group of tropical freshwater fish in the family Cichlidae (Oreochromis, Tilapia, and Sarotherodon spp.) that are indigenous to Africa and the southwestern Middle East. Since the 1930s, tilapias have been intentionally dispersed worldwide for the biological control of aquatic weeds and insects, as baitfish for certain capture fisheries, for aquaria, and as a food fish. They have most recently been promoted as an important source of protein that could provide food security for developing countries without the environmental problems associated with terrestrial agriculture. In addition, market demand for tilapia in developed countries such as the United States is growing rapidly."

"Tilapias are well-suited to aquaculture because they are highly prolific and tolerant to a range of environmental conditions. They have come to be known as the 'aquatic chicken' because of their potential as an affordable, high-yield source of protein that can be easily raised in a range of environments } from subsistence or 'backyard' units to intensive fish hatcheries. In some countries, particularly in Asia, nearly all of the introduced tilapias produced are consumed domestically; tilapias have contributed to basic food security for such societies."

"This review indicates that tilapia species are highly invasive and exist under feral conditions in every nation in which they have been cultured or introduced. Thus, the authors have concluded that, despite potential or observed benefits to human society, tilapia aquaculture and open-water introductions cannot continue unchecked without further exacerbating damage to native fish species and biodiversity. Recommendations include restricting tilapia culture to carefully managed, contained ponds, although exclusion is preferred when it is feasible. Research into culture of indigenous species is also recommended."

Other species of Tilapia that have also shown to be invasive include:

Nile Tilapia (Oreochromis niloticus) – From Martin et al. 2010: "we predict that the proliferation of tilapia (and perhaps other aggressive aquaculture fishes) will have important detrimental effects on the structure of native food webs in shallow, structured coastal habitats."

Spotted Tilapia (*Tilapia mariae)* – From GISD (2009): "*Tilapia mariae* dominates introduced habitats, representing a competitive threat to native species and can lower biodiversity. They are extremely aggressive and territorial while breeding. They are capable of rapid invasion and have high fecundity. *T. mariae* can compete with native fish for resources such as prey or breeding sites which can cause the displacement of native fish species. In much of its introduced range, *T. mariae* is the dominant species both by number and biomass (Cribb 2006; GSMFC 2005)."

4 Global Distribution

Figure 1 (above). Global distribution of *T. rendalli*. Map from GBIF (2010).

5 Distribution within the United States

Figure 2 (above). Distribution of *T. rendalli* in the United States (Hawaii and Puertoa Rico). Map from Nico (2012).

6 CLIMATCH

Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010; 16 climate variables; Euclidean Distance) was high on the southern tip of Florida. Medium-high matches were found around the Gulf of Mexico and along the border with Mexico. Medium matches covered most of the West Coast and southern states. Low matches were dispersed around most of the country and dominated the northern regions. Climate 6 match indicated that the United States has a high climate match. The range for a high climate match is 0.103 and greater; the climate match of *T. rendalli* is 0.133.

Figure 3 (above). CLIMATCH (Australian Bureau of Rural Sciences 2010) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *T. rendalli* climate matching. Source locations from GBIF (2010) and from Nico (2012). Only locations with established populations were used.

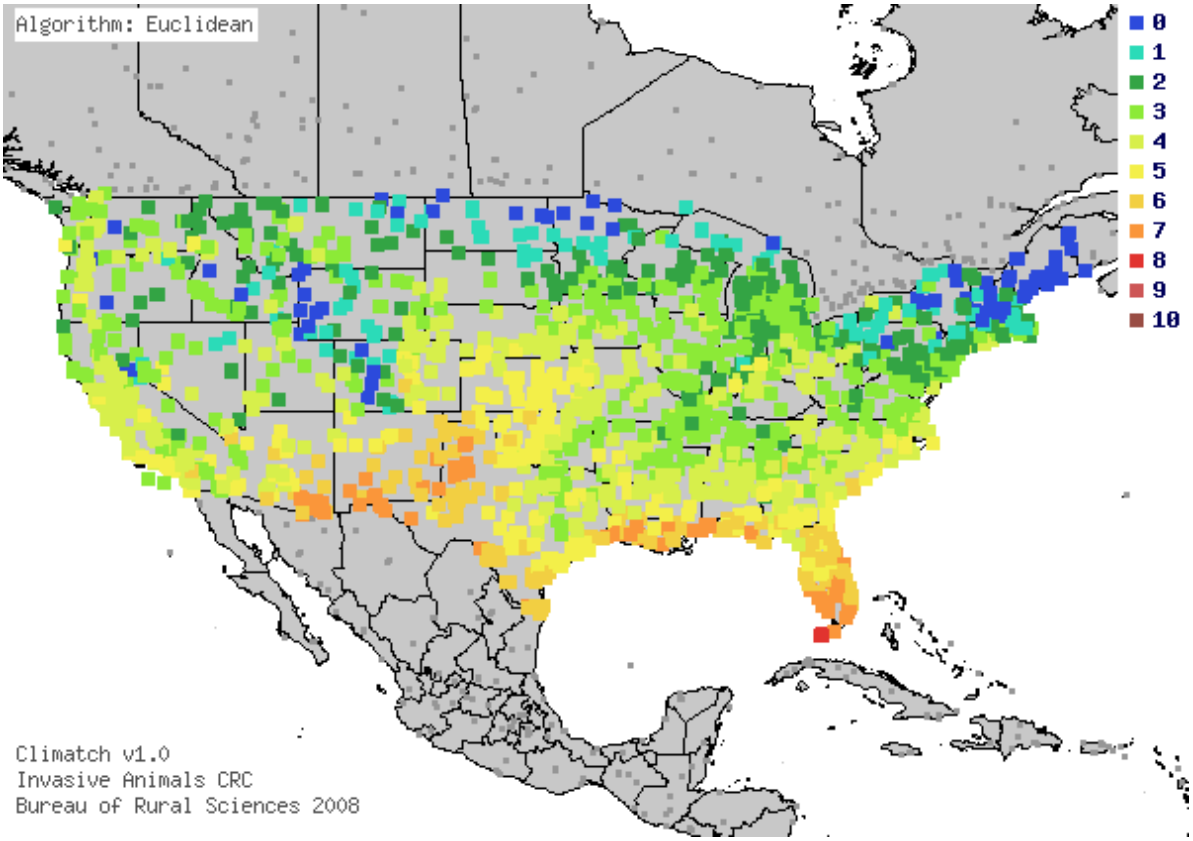

Figure 4 (above). Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *T. rendalli* in the continental United States based on source locations reported by GBIF (2010) and Nico (2012). 0= Lowest match, 10=Highest match.

Table 1 (below). CLIMATCH (Australian Bureau of Rural Sciences 2010) climate match scores.

CLIMATCH Score	0	1	2	3	4	5	6	7	8	9	10
Count	82	122	276	474	491	270	180	81	3	0	0
Climate 6 Proportion = 0.133 (High)											

7 Certainty of Risk Assessment

The introduction and establishment of *T. rendalli* has been documented in Hawaii and Puerto Rico. However, while the group of fish known as Tilapia are known to be invasive (with numerous examples across the globe), no peer-reviewed research could be found specifically documenting the impacts *T. rendalli* may have to non-native habitats. Information on the biology of *T. rendalli* is also fairly limited. This lack of sufficient information on invasive impacts results in an uncertain history of invasiveness. Certainty of this assessment, therefore, is low.

8 Risk Assessment

Summary of Risk to the Continental United States

Although closely-related species are highly invasive and FishBase.org lists *T. rendalli* as a "potential pest," there are no known records of any significant history of invasiveness specific to this species. *T. rendalli* has a high climate match with medium matches covering a broad area of the country. The point map from Nico (2012) reports the status of *T. rendalli* in Hawaii and Puerto Rico as "established." By contrast, the Nico (2012) fact sheet reports the status of *T. rendalli* in Hawaii as "uncertain," and does not specify the status in Puerto Rico.

Assessment Elements

- **History of Invasiveness (Sec. 3):** Uncertain
- **Climate Match (Sec. 6):** High
- **Certainty of Assessment (Sec. 7):** Low
- **Overall Risk Assessment Category:** Uncertain

9 References

Note: References cited within quoted text but not accessed for this ERSS are included in Section 10 below.

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